
Working Paper



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The BU Ratio: Prospect and Retrospect

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ABSTRACT

This purpose of this paper is to examine the recent fall in the BU ratio — the ratio of EI beneficiaries to the unemployed. To what extent is this fall due to programme changes, and to what extent is it a temporary phenomenon related to the recession of the early 1990s? To answer these questions we construct an aggregate time series model of the relationship between the BU ratio and the labour market, using our previously developed EI Disincentives Index. This model is then used to analyze the path of the BU ratio in recent years and to project its behaviour in the future given certain assumptions about the future path of unemployment.

RESUME

Ce document analyse la baisse du ratio PC — le ratio du nombre de prestataires ordinaires d'assurance-emploi sur le nombre de chômeurs — depuis les années quatre-vingts. Quelle partie de ce déclin est due aux changements dans le programme assurance-emploi, et quelle proportion est due à la récession des années quatre-vingt dix ? Pour répondre à cette question, nous construisons un modèle économétrique de la relation entre le ratio PC et le marché du travail, en utilisant notre indice des effets dissuasifs du système d'assurance-emploi. Ce modèle est alors utilisé pour analyser le comportement du ratio PC et pour faire une prévision de son comportement dans l'avenir, étant donné certaines hypothèses sur le comportement du taux de chômage.

I. Introduction

In this paper we examine the past and future behaviour of the BU ratio — the ratio of EI beneficiaries to the unemployed. Our object is to trace the factors behind the unprecedented fall in the BU ratio over the last decade in order to determine the extent to which the BU ratio might recover to its pre-recession level.

The paper is organized as follows:

- *Section II – Stylized Facts.* This section briefly outlines the behaviour of the EI programme, the nature of successive EI reforms, and relevant changes in the Canadian labour market over the last two decades.
- *Section III – An Accounting Framework for the BU Ratio.* In Section III we introduce the concept of a potential beneficiary — an unemployed person who is likely to be eligible for EI. This excludes those, including the long-term unemployed, new entrants to the labour market and students, who would not normally be eligible for EI. To the extent that the fall in the BU ratio is due to a fall in the proportion of potential beneficiaries in the unemployed, it cannot be attributed to changes in programme parameters, because the aforementioned groups have *never* been eligible for EI.
 - We then decompose the aggregate BU ratio to find out what proportion of the fall in the BU ratio can be explained, in an accounting sense, by a fall in the proportion of the unemployed who are potential beneficiaries, and what proportion can be explained by a fall in the proportion of potential beneficiaries who are beneficiaries.
 - This decomposition is then performed for different regions and different age groups.
- *Section IV – A Macroeconomic Model of the EI Programme.* In this section we use the accounting framework of Section III to construct an econometric model of the BU ratio. The econometric model goes further than the accounting framework because it explains changes in the proportion of beneficiaries and potential beneficiaries in terms of programme changes and changes in the labour market. The model therefore allows us to:
 - Understand why the BU ratio has fallen so much in the last decade.
 - Generate projections of the aggregate BU ratio conditional on an assumed path for the unemployment rate.
 - Generate projections of the BU ratio by region and by age group.

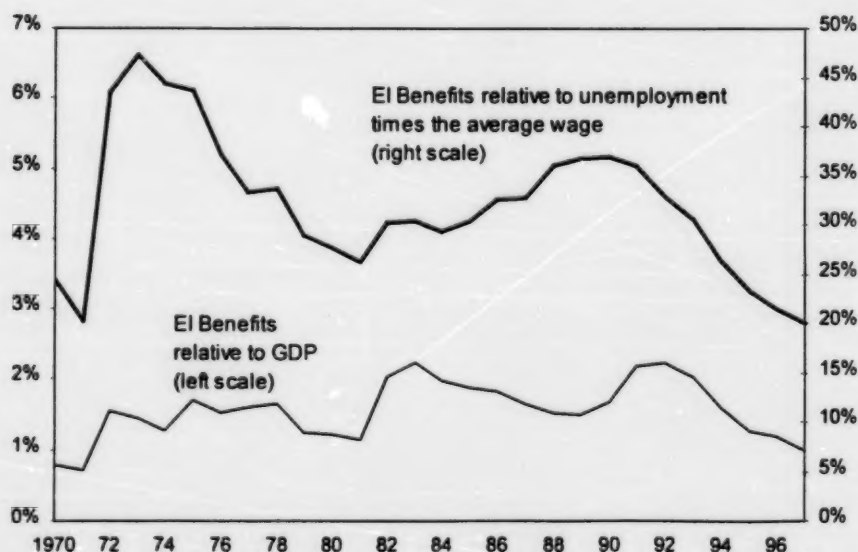
II. Stylized Facts

We begin by examining three sets of stylized facts: measures of EI programme spending based on administrative data; the recent history of legislative changes to the EI programme; and those changes in overall labour market conditions which may have affected the size of the programme in recent years.

1. Regular EI Expenditures

Figure 1 below shows two measures of the size of the EI Regular Benefits programme. The first is total regular benefits as a proportion of GDP. By this yardstick, the size of the EI programme fell from 2.2 per cent of GDP in 1992 to 1.0 per cent of GDP in 1997. However, this drop is partly a reflection of the fall in unemployment since 1992. To control for this we calculate the ratio of EI benefits to the total number of unemployed multiplied by average wages. This shows the extent to which the EI programme replaces the income of the unemployed, assuming that the unemployed earn the average wage; it can be thought of as a measure of the size of the EI programme relative to the unemployment problem that the programme is supposed to address. By this measure, the EI programme grew from about 26 per cent of lost income in 1981 to a peak of 37 per cent during the period 1989–1990; subsequently the size of the programme fell to a post-1971 low of 20 per cent in 1997.

Figure 1: Regular EI Programme Expenditures 1970–1997



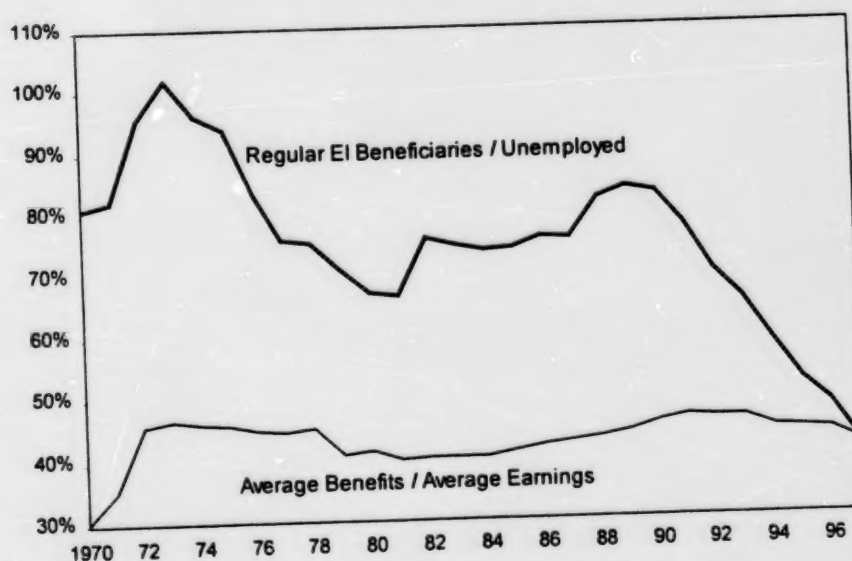
One way of examining the determinants of the fall in the relative size of the EI programme is to use EI administrative data to decompose our overall measure of the size of the programme using the following identity. Our measure of the relative size of the programme, depicted in Figure 1 above, can be expressed as $RegExp/(U \cdot AWE)$, where $RegExp$ is total regular EI benefits, U is the total number of unemployed, and AWE is average weekly earnings². This measure can be decomposed as follows:

$$\frac{RegExp}{U \cdot AWE} \equiv \frac{AWB}{AWE} \cdot \frac{BEN}{U},$$

where AWB is the average weekly EI benefit and BEN is the total number of EI beneficiaries. The latter term in the decomposition, the ratio of EI beneficiaries to the unemployed (BEN/U), is popularly known as the BU ratio: it often features in policy discussions about the adequacy of the EI programme. Decomposing overall spending into the product of the BU ratio and average benefits is useful because the BU ratio—the proportion of the unemployed receiving EI—is determined by factors such as eligibility rules and changes in work patterns that are quite different from determinants of benefit rates such as statutory replacement rates and changes in average earnings.

Figure 2 below shows that it is the BU ratio that has been largely responsible for the fall in the size of the programme since the mid-1980s. If we compare the years 1987 and 1997, when the

Figure 2: The BU Ratio and the Average Replacement Rate



² See Appendix I for data sources and detailed definitions.

unemployment rate was about the same (8.9 per cent in 1987 and 9.2 per cent in 1997), we find that the ratio of average weekly benefits to average weekly earnings was about the same (42 per cent). On the other hand, the BU ratio fell from 75 per cent to 42 per cent over the same period. It is therefore to the BU ratio that we must look for an explanation of the decline in the size of the EI programme, although the behaviour of average benefits would still be a factor in the cyclical response of the EI system.

2. Programme Parameters

Changes to programme parameters are a key influence upon changes in the BU ratio, the average replacement rate, and ultimately the size of the programme. Table 1 below lists the main changes since 1976 that have affected eligibility for benefit, benefit durations, and replacement rates.

Table 1: Principal Changes to the EI Programme since 1976

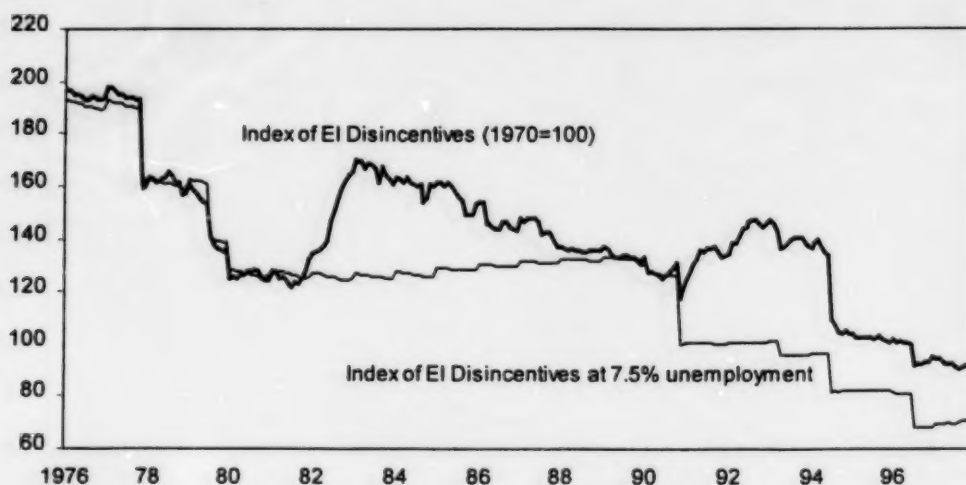
	Eligibility	Duration	Replacement Rates
1976	Disqualification period for quitters is raised from 3 to 6 weeks.		Replacement rate for those with dependants is cut to 67 per cent from 75 per cent.
1977	Minimum weeks of work is raised from 8 weeks to 10-14 weeks, and made dependent on regional unemployment rates.	Maximum duration cut from 51 weeks to 50 weeks.	
1979	New or re-entrants required to have 20 weeks of work. Repeat claimants must have up to 6 extra weeks of work.		Replacement rate cut to 60 per cent and high-income clawback introduced.
1990	Entrance requirements now 10-20 weeks. Extra weeks requirement for repeat claimants is eliminated. Quitters disqualified for 12 weeks.	Benefit duration schedule changed to reduce benefit duration.	Replacement rate for quitters reduced to 50 per cent.
1993	Quitters completely disqualified.		Replacement rate reduced to 57 per cent.

1994	Entrance requirements now 12-20 weeks.	Benefit duration schedule changed to reduce benefit duration.	Replacement rate reduced to 55 per cent, except for those with dependants and low earnings.
1996	Entrance requirement for new and re-entrants raised to 26 weeks.	Maximum benefit duration cut to 45 weeks.	Maximum Insurable Earnings frozen in nominal terms until 2000. Lower replacement rate and extended income tax clawback for repeat users. Work intensity test reduces benefits for those with few weeks of work. Higher replacement rate for low income recipients with children.
1997	Entrance requirements now based on hours rather than weeks.		Adjustment projects partially undo impact of work intensity test.

To summarize the impact of the many changes to the EI programme detailed in Table 1, we make use of the Index of EI Disincentives described in Sargent (1995; 1998). The Index is based on a classical model of labour supply, and it measures the extent to which the EI system provides a disincentive to work. Longer benefit durations, for example, would increase the incentive to remain unemployed and so increase the value of the Index. The time series behaviour of the Index is shown in Figure 3 below. The data are shown at a monthly frequency in order to highlight the impact of programme changes. Notable are the large rise in disincentives during the 1981-1982 recession, as higher regional unemployment rates raised benefit durations and reduced entrance requirements, and the decline in disincentives in 1990 and 1994, coinciding with the legislative changes in those years.

In order to isolate the impacts on behaviour of legislative changes versus economic conditions, it is desirable to have a measure of disincentives that does not vary with the unemployment rate. Figure 3 therefore depicts as well the Index of EI Disincentives in a region with a 7.5 per cent unemployment rate³. This measure still varies over time because it reflects the impact of changes in average wages on the effective replacement rate for those above the maximum insurable

³ Note that the only provincial variation in the EI index comes from differing unemployment rates across provinces.

Figure 3: EI Disincentives 1976–1997

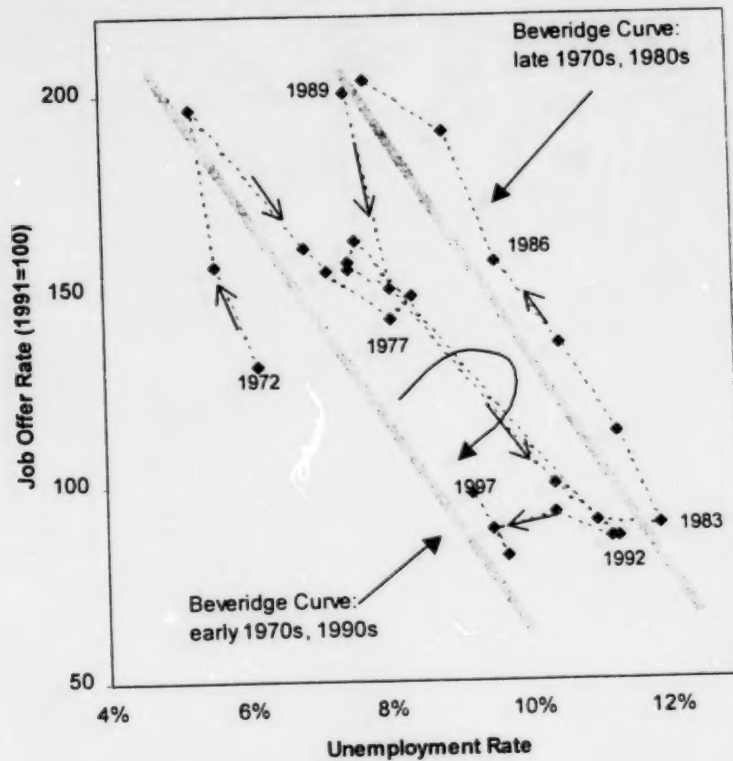
earnings limit. However the influence of changes in the unemployment rate has been removed. One can see that the 1990, 1994 and 1996 reforms have all led to significant reductions in EI disincentives.

3. The Labour Market

Although the various reforms of the EI programme in recent years have certainly had an effect upon the BU ratio in particular and the size of the Regular Benefits programme in general, there are other reasons why the BU ratio might have fallen — both macroeconomic conditions and structural changes in the labour market may have been just as important as benefit regulations. We turn therefore to a consideration of the main trends affecting the Canadian labour market in recent years.

If one examines Canadian unemployment since 1972, one is struck by two things: unemployment on average has been higher in the 1980s and 1990s than in the 1970s; and the recovery from the 1990–1991 recession has been slower than the recovery from the 1981–1982 recession. However, the unemployment rate is not necessarily a good indicator of slack in the labour market: it ignores structural factors, such as demographic changes and the generosity of social programmes, that may increase or reduce wage pressures at a given unemployment rate. The Beveridge curve, depicted in Figure 4 below, allows demand- and supply-side influences on unemployment to be separated. The Beveridge curve is the relationship between vacancies and unemployment over the business cycle for a given level of structural unemployment. It normally slopes downwards: higher vacancy rates imply a stronger demand for labour and thus lower unemployment. However, the Beveridge curve may also shift in or out as a result of changes in structural unemployment. If firms have trouble finding workers with the right skills, or if the

Figure 4: The Beveridge Curve in Canada 1972–1997



unemployed are more reluctant to accept the jobs available at the going wage, then unemployment will be higher for a given vacancy rate, and the Beveridge curve will shift out. We use the job offer rate (*JOR*) as our measure of vacancies. This is the Help Wanted Index divided by total employment, indexed so that 1991=100. See Appendix I for further details.

The data on unemployment rates and job offer rates shown in Figure 4 appear to be consistent with a shifting out of the Beveridge curve in the mid-1970s, and a corresponding shift back in the mid-1990s. This is consistent with an increase in the rate of structural unemployment (the natural rate of unemployment) in the 1970s and a corresponding fall in the mid-1990s. In 1986 a job offer rate of 157 was required to bring unemployment down to 9.6 per cent; in 1996 the same unemployment rate required a job offer rate of only 82. It appears, therefore, that there was a good deal more labour market slack in 1996 than in 1986, even though the measured unemployment rates were the same. This points to a crucial difference between the 1981–1982 and 1990–1991 recessions: whereas structural unemployment was largely stable during and after the 1981–1982 recession (i.e. the Beveridge curve was stable), the 1990–1991 recession coincided with a fall in the rate of structural unemployment (i.e. the Beveridge curve shifted in). This implies that the gap between actual and structural unemployment has been wider in the

1990s than in the 1980s, because although actual unemployment followed a similar path in both recessions, structural unemployment fell after the 1990–1991 recession, but not after the 1981–1982 recession.

The persistence of a large degree of labour market slack since 1990 has important implications for the duration structure of unemployment. A given unemployment rate can be consistent with a high incidence of unemployment and low unemployment duration (typical of the start of a recession), so that the stock of unemployed turns over rapidly, or a low incidence and long duration of unemployment (typical of a recovery), so that fewer people enter the unemployment pool each month, but once in the pool their chances of leaving are much lower. The duration structure of unemployment is very important for the analysis of EI benefit reciprocity rates because EI benefits are limited in duration: claimants can only receive benefit for 3 to 11 months, depending on the unemployment rate in their EI region and the number of weeks they have worked during their qualifying period.

Figure 5: Measures of Long-Term Unemployment

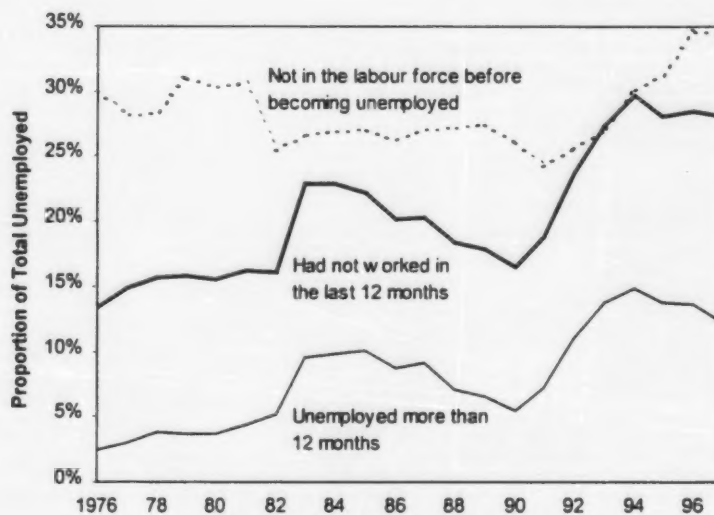
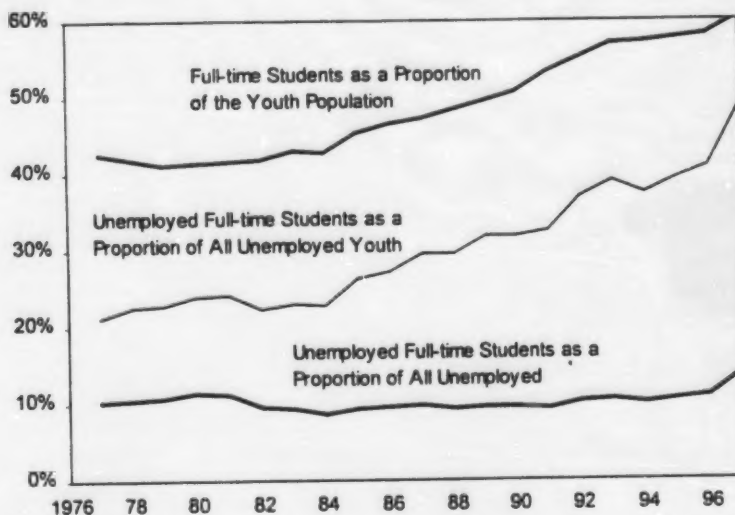


Figure 5 shows various measures of long-term unemployment. The series labelled 'Unemployed more than 12 months' is the proportion of the unemployed who have been *continuously* unemployed for more than 12 months. This proportion rose from 5.5 per cent in 1990 to 12.8 per cent in 1997, which is significantly higher than the peak value after the 1981–1982 recession of 10.1 per cent in 1985. However, there was an even bigger rise in absolute terms in the proportion of the unemployed who had not worked in the last 12 months (but who had worked before): from 16.5 per cent in 1990 to 28.1 per cent in 1997. The reason why the proportion of the unemployed who have not worked in the last year is so much larger than the proportion continuously unemployed for more than twelve months is explained by the existence of people who leave the

labour market for a period, but who then return to look for work. As Figure 5 illustrates, the proportion of the unemployed who were *not* in the labour force prior to their current spell of unemployment rose from 24.3 per cent in 1991 to 34.5 per cent in 1997.

There have been important changes in the youth labour market since the mid-1980s. Figure 6 shows that the school enrolment rate for youth rose from 43 per cent in 1977 to 60 per cent in 1997. As a result, full-time students now make up 49 per cent of all youth unemployment, up from 22 per cent in 1977. This trend is important because full-time students are typically not eligible for EI benefits, and so a rise in the proportion of youth who are full-time students would tend to reduce the BU ratio, *ceteris paribus*. However, this tendency has been offset by the ageing of the population, which has reduced significantly the proportion of youths in the labour market. As a result of these two offsetting forces the proportion of students in total unemployment has remained largely stable since 1977.

Figure 6: Importance of Students in the Youth Labour Force



Another noticeable trend in the labour force has been the increase in the number of self-employed, especially owners of unincorporated businesses, since 1990. This phenomenon may well be behind the recent drop in the proportion of employed persons making EI contributions, depicted in Figure 7, as the self-employed are not generally covered by the EI programme. The other possible explanation for the fall in the coverage rate would be an increase in the proportion of employed persons who work less than 15 hours per week and earn less than 20 per cent of Maximum Insurable Earnings: however, as Figure 8 makes clear, the proportion of workers with very few hours has remained largely constant over the last two decades at around 3 per cent of total employment. It is an open question whether the rise in the proportion of the self-employed is a secular trend or a response to fewer job opportunities for employees.

Figure 7: Coverage of the Employment by the EI Programme

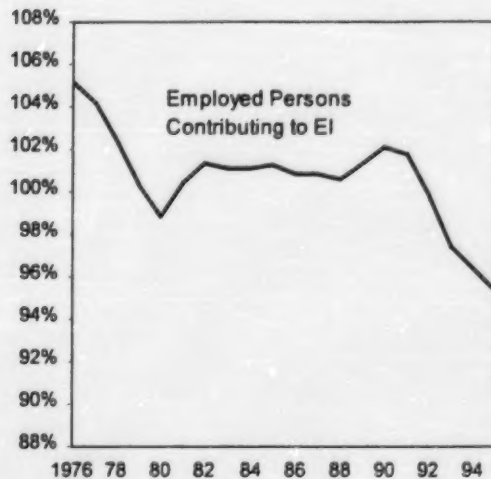
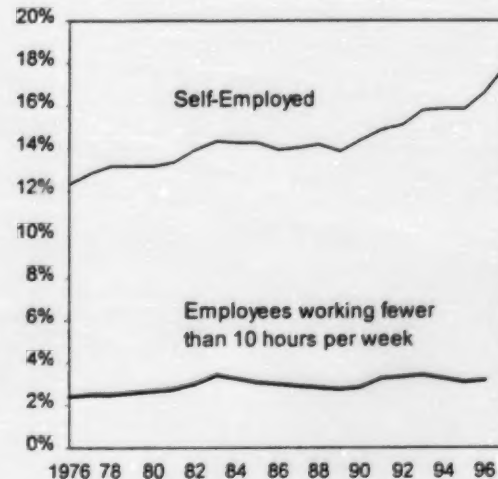


Figure 8: Proportion of Self-Employed and Part-Time Workers in Total Employment



Note: The coverage rate is derived from income tax data, and so 1996 data are not yet available. Note that the coverage rate can be greater than one because the numerator is the number of people contributing, regardless of how long they contributed, whereas the denominator is average employment throughout the year.

Although the rise in the proportion of self-employed workers can be plausibly blamed for a good part of the drop in the coverage rate of the EI programme, it is much more doubtful whether this trend can explain much of the fall in the BU ratio. The reason is that the self-employed have much lower unemployment rates than employees. Using the 1994 Survey of Labour and Income Dynamics (SLID), we found that the unemployment rate amongst the formerly self-employed was only 3 per cent — about one-quarter of the 12 per cent unemployment rate for employees. Using this ratio, the 4 percentage point rise in the proportion of self-employed since 1976 would have lowered the BU ratio by about 1 percentage point, assuming that unemployment rates for the self-employed relative to employees remained roughly constant over that period. Lévesque (1989) also finds that there are few self-employed amongst the unemployed.

III. An Accounting Framework for the BU Ratio

In order to delve more deeply into the drop in the BU ratio, in this section we develop an accounting framework that decomposes changes in the BU ratio. This framework will form the basis of our estimation model in section IV. Central to the accounting framework is the concept of a *potential beneficiary*. This term was first used by Lévesque (1989): it denotes those unemployed persons who could, in principle, be eligible for EI benefits. Those who would not be potential beneficiaries include full-time students, the self-employed, those entering the labour force for the first time, and those who have not worked in the last twelve months. The concept of the potential beneficiary is useful for our purposes because changes in the number of potential beneficiaries are not linked directly to changes in programme parameters. This is because full-time students, the self-employed, and those who have not worked in the last twelve months have *never* been eligible for EI. We can therefore decompose the BU ratio into the product of two quantities: the proportion of the unemployed who would potentially be eligible for EI; and the proportion of potential beneficiaries who are actually receiving EI benefits.

1. Aggregate Model

In Table 2 we illustrate the construction of the accounting framework for two years: 1987 and 1997. We begin with total unemployment as measured by the Labour Force Survey (LFS). From this total we deduct those who have never worked (labour market entrants), those who have not worked in the last twelve months, and those who left their last job to become students, to give a figure for potential beneficiaries. In 1987, 72 per cent of the unemployed were potential beneficiaries by this measure; by 1997 the proportion had fallen to 58 per cent. Thus, although the number of unemployed *rose* by 17 per cent between the two years, the number of potential beneficiaries actually *fell* by 6 per cent. Ideally one would want to follow Lévesque and deduct from total unemployment other categories of unemployed that are not eligible for EI benefits, such as the self-employed and those in the two-week waiting period for benefits, but data limitations preclude this possibility. However, we do not believe that these omissions seriously bias our results: as we noted in the previous section, the self-employed may be a growing portion of the employed but they are a small proportion of the unemployed; and the proportion of those in the waiting period is likely to be quite stable, given that the proportion of those unemployed less than a month has remained largely constant since 1976.

The next step is to construct a series for beneficiaries that is consistent with the potential beneficiaries series. To do this we must deduct from the total number of regular beneficiaries those beneficiaries who report earnings, because these persons would be counted as employed, not unemployed, by the LFS. This enables us to construct a series that is the ratio of beneficiaries (without earnings) to potential beneficiaries. Table 2 shows that this ratio fell from 0.92 in 1987 to 0.62 in 1997, a fall of 32 per cent.

Table 2: Accounting for Changes in the BU Ratio between 1987 and 1997

	1987	1997	% change
	<i>in thousands</i>		
Total Unemployed (LFS)	1,208	1,414	17%
- Never Worked	48	145	205%
- Not Worked in Last Year	245	397	62%
- Students who Worked in Last Year	47	55	19%
	339	598	76%
= Potential Beneficiaries	869	816	-6%
Total Regular EI Beneficiaries	909	589	-35%
- Beneficiaries with Earnings	109	82	-24%
= Beneficiaries Without Earnings	800	507	-37%
Beneficiaries/Potential Beneficiaries	0.92	0.62	-32%
x Potential Beneficiaries/Unemployed	0.72	0.58	-20%
= BU Ratio (Without Earnings)	0.66	0.36	-46%
/ Proportion of Beneficiaries without Earnings	0.88	0.86	-2%
= BU Ratio	0.75	0.42	-45%

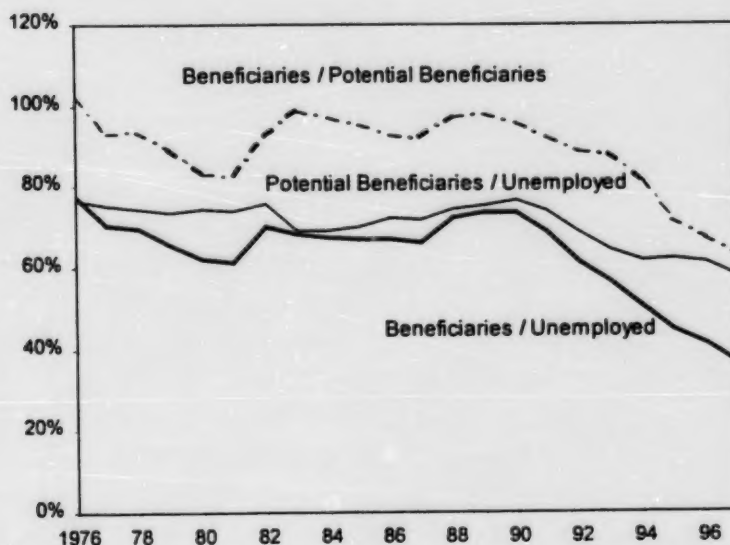
The BU ratio for those without earnings is then the product of the two measures: the ratio of beneficiaries to potential beneficiaries (0.62 in 1997) and the ratio of potential beneficiaries to the unemployed (0.58 in 1997). If the BU ratio for those without earnings is then divided by the proportion of EI beneficiaries who do not report earnings (0.86 in 1997), we arrive at the overall BU ratio (0.42 in 1997).

We are now in a position to decompose the 45 per cent drop change in the BU ratio between 1987 and 1997 into three components: the part due to a fall in the ratio of beneficiaries to potential beneficiaries; the part due to a fall in the ratio of potential beneficiaries to the unemployed; and the part due to a fall in the proportion of beneficiaries without earnings. Over the 1987-1997 period the BU ratio for those without earnings fell by 38 per cent from 0.66 to 0.36. Over this period, as we have seen, the ratio of potential beneficiaries to total unemployment

fell by 20 per cent, and the ratio of actual beneficiaries to potential beneficiaries fell by 32 per cent. This implies that about 40 per cent of the fall in the BU ratio for those without earnings can be ascribed to a rise in the proportion of the unemployed who would have been ineligible for EI even if the parameters of the system had remained unchanged since 1987. On the other hand 60 per cent of the fall in this BU ratio is attributable to a fall in the recipiency rate amongst those who would generally have been eligible for benefits in 1987. The aforementioned results carry over to the overall BU ratio, as there was little change in the proportion of beneficiaries without earnings.

In Figure 9 we illustrate the results of the accounting decomposition described above for the whole 1976–1997 period. Until about 1990 both the ratio of beneficiaries to potential beneficiaries and the ratio of potential beneficiaries to the unemployed were fairly stable. However since 1990 both measures have shown a significant downward trend, the ratio of beneficiaries to potential beneficiaries falling somewhat faster than the ratio of potential beneficiaries to the unemployed.

Figure 9: Decomposition of the BU Ratio for those without Earnings 1976–1997



It is important to stress, however, that not all those whom we count as potential beneficiaries would be eligible for benefits: they may have not had enough weeks of employment in their qualifying period to obtain EI, or their benefits may have run out. The proportion of the unemployed for whom this is true will be affected not only by changes in benefit parameters, but also by the structural and cyclical changes in the labour market outlined in Sections II. Also, one must bear in mind that some beneficiaries without earnings may not be counted as unemployed by the LFS because they have not looked for work in the last 4 weeks. For these reasons

econometric analysis is required before we can be really sure about the causes of the fall in the BU ratio. This is the purpose of the macroeconometric model presented in Section IV.

2. Regional Breakdown

Figures 10 to 13 below show the accounting breakdown of the BU ratio (for those without

Figure 10: Atlantic

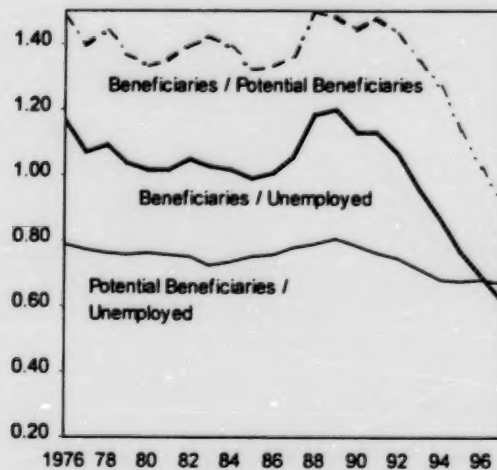


Figure 11: Quebec

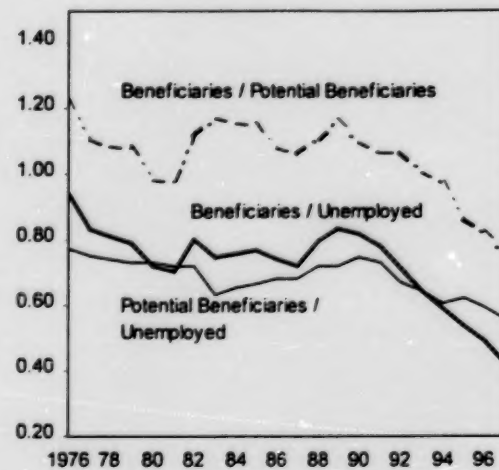


Figure 12: Ontario

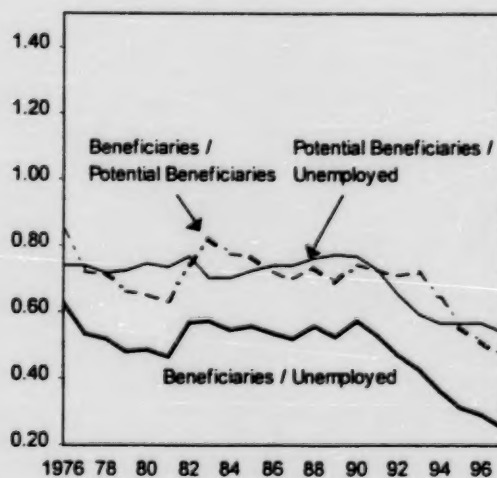
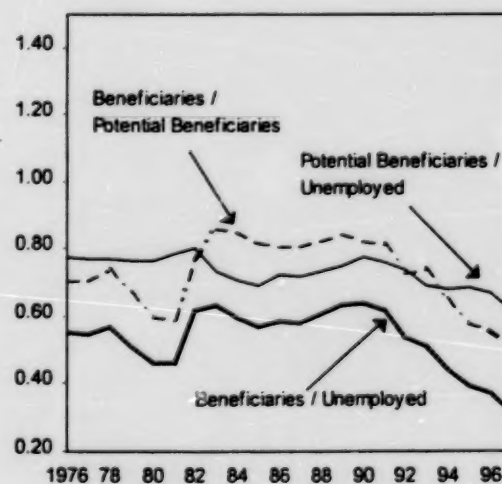


Figure 13: West



reported earnings) by region. The level of the BU ratio differs markedly by region, being much higher in the Atlantic region than elsewhere. Nevertheless, the time series behaviour of the BU ratio and its components is quite similar in each region, with large falls in the BU rate and the ratio of beneficiaries to potential beneficiaries, and a lesser fall in the ratio of potential beneficiaries to the unemployed. In absolute terms the fall in the BU ratio is somewhat greater in the Atlantic region, although in percentage (not percentage point) terms Ontario and the West had the largest declines. Also noteworthy is that a greater proportion of the decline in the BU ratio in Ontario was due to a decline in the ratio of potential beneficiaries to the unemployed: this is a result of the much greater increase in the proportion of long-term unemployed in Ontario in the 1990s.

3. Age Breakdown

Figures 14 and 15 show the accounting framework decomposition of the BU ratio for those without earnings by age group. The BU ratio for youth is much lower than that for adults: in 1997 only 15 per cent of unemployed youth received benefits, compared to 44 per cent of unemployed adults. There are a number of reasons why youths would have a lower BU ratio than adults. One reason is that youths are much more likely to be new entrants or students, and thus ineligible for benefits. This is reflected in the lower ratio of potential beneficiaries to the unemployed for youths. Equally as important, however, is the fact that youths tend to have much less stable employment patterns, and are therefore less likely to have accumulated the necessary weeks of work to qualify for EI benefits. This is reflected in the lower ratio of beneficiaries to potential beneficiaries for youths.

It is apparent from Figures 14 and 15 that the BU ratio has fallen much further for youths than it

Figure 14: Youths (Aged 15-24)

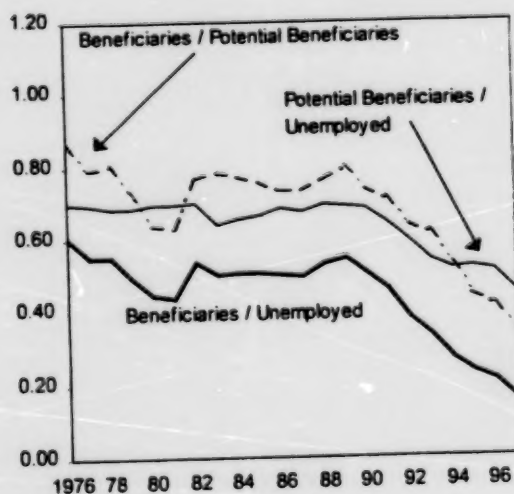
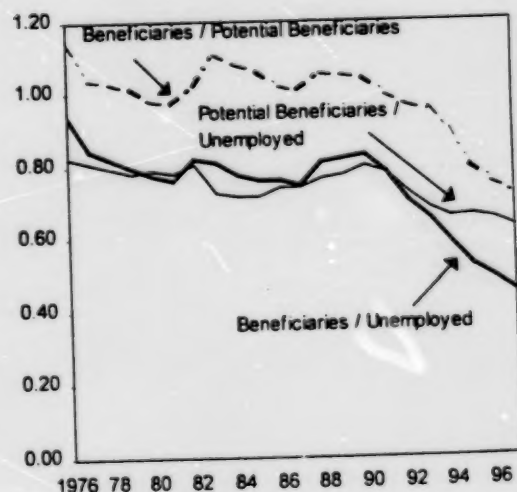


Figure 15: Adults (Aged 25+)



has for adults. Between 1987 and 1997 the BU ratio for youths fell by 70 per cent, from 0.49 to 0.15. In contrast, the BU ratio for adults fell by only 41 per cent, from 0.75 to 0.44. For both youths and adults, about one-third of the drop was caused by a fall in the proportion of potential beneficiaries amongst the unemployed, with the remainder of the drop caused by a fall in the proportion of potential beneficiaries receiving benefits. It should be noted however that the impact of the greater fall in the BU ratio amongst youth on the aggregate BU ratio was almost entirely offset by the fall in the proportion of youths in the unemployed, stemming from the relative fall in the youth population.

4. Conclusions

The accounting framework indicates that 40 per cent of the fall in the BU ratio between 1987 and 1997 was caused by a rise in the proportion of the unemployed who have always been ineligible for benefits, with the remainder caused by a fall in the proportion of potential beneficiaries receiving benefits. These proportions were fairly similar across regions and across age groups.

However, it is important not to leap to premature conclusions about the causes of these changes. The decompositions reported above are only a preliminary guide to the underlying causes of the fall in the BU ratio. Not all changes in the proportion of potential beneficiaries receiving benefits are due to changes in programme parameters: labour market conditions could certainly affect the proportion of unemployed who have worked enough weeks to qualify for EI. Similarly, one cannot rule out the possibility that changes in programme generosity might influence the amount of time that some workers spend unemployed: to the extent that some of these workers remained out of work for more than a year, the proportion of potential beneficiaries will rise. Econometric modelling will allow us to draw a finer distinction between the effects of cyclical influences and programme-induced changes on the BU ratio, and to this we now turn.

IV. A Macroeconomic Model of the EI Programme

In this section we outline our econometric model of the EI programme. This model is estimated on three different data sets: aggregate data; data disaggregated by region; and data disaggregated by age. This allows us to project not only the aggregate BU ratio but also the BU ratio by region and age group. Unfortunately, data disaggregated by age *and* region are not available, so we cannot provide projections at this level of disaggregation.

1. Estimation Model

The estimation model is described in detail in Appendix II, and so here we present only a very brief description. The model is designed to explain the EI account surplus or deficit relative to total earnings as a function of labour market conditions and the policy parameters of the EI system. There are three blocks, each estimated separately: an EI expenditure block, with behavioural equations for the ratio of beneficiaries to potential beneficiaries, the ratio of potential beneficiaries to the unemployed, the ratio of beneficiaries without earnings to all beneficiaries, and the average replacement rate; an EI revenue block, with a behavioural equation for the EI revenue base; and a labour market block, with a behavioural equation for a Beveridge curve relationship between unemployment and vacancies. We are careful to allow for the endogenous interplay between the unemployment rate and the parameters of the EI system that is such an important feature of the Canadian EI system, and we also allow for the effect of the EI system on labour supply and thus the natural rate of unemployment and actual labour market conditions.

Each block in the system was estimated separately, over the period 1977–1997, by two-stage least squares or iterative three-stage least squares. Hsiao (1997) demonstrates that these estimators are consistent, and that the standard hypothesis tests are valid, even in the presence of unit roots. The estimation results for all three blocks of equations are given in Appendix III below. The adjusted R-squared statistics were all well above 0.90, and the parameter estimates were correctly signed and significant, except in a few cases.⁴

2. Explaining the Decline in the Aggregate BU Ratio between 1987 and 1997

Given the estimations from the econometric model, we are now in a position to examine the fall in the BU ratio in the 1990s. Table 3 shows a decomposition of the fall in the overall BU ratio between 1987 and 1997. The first column shows the actual EI system in 1987 given the actual macroeconomic conditions prevailing in that year, and the second column shows the same data for 1997. The third column shows what the model predicts would have occurred in 1997, had EI disincentives been at the 1987 levels (or 1986 levels in the case of those lagged values of EI

⁴ These exceptions occurred in equations (1.4) and (2.2), where the current value of a variable was insignificant but the lagged variable was not. Also in equation (1.2) the *SOCASS* variable was significant at only the 20% level.

disincentives that enter into the econometric model). By comparing the actual 1997 outcome with what our model tells us would have occurred if the EI system had been the same as in 1987 we are able to derive the portion of the change in the BU ratio that would have occurred even had there been no EI reform.

Table 3: Decomposition of the Fall in the BU Ratio between 1987 and 1997

Macroeconomic Variables	1987	1997		1997	
EI System	1987	1997		1987	
			% change		% change
Beneficiaries / Potential Beneficiaries	0.93	0.63	-32%	0.80	-14%
X Potential Beneficiaries / Unemployed	0.71	0.60	-16%	0.61	-13%
/ Prop. of Beneficiaries w/o Earnings	0.89	0.87	-2%	0.89	0%
equals:					
BU Ratio (All)	0.74	0.43	-42%	0.55	-25%

Note: Figures given above are predicted values from the estimation model, and thus differ slightly from the actual numbers shown in Table 2 above.

According to Table 3, roughly two-fifths (14% / 32%) of the fall in the ratio of beneficiaries to potential beneficiaries would have occurred even had there been no change in programme parameters, as a result of changing macroeconomic conditions. In this case the BU ratio would have fallen to 0.55, rather than 0.43. This implies that three-fifths (25% / 42%) of the 32 percentage points fall in the BU ratio can be ascribed to changes in underlying economic conditions, either through their influence on the proportion of potential beneficiaries in the unemployed or their influence on the proportion of potential beneficiaries who receive benefits. Thus even without programme changes, the BU ratio would still have fallen to its lowest level in two decades.

Table 4 below breaks down the changes in the ratios of beneficiaries to potential beneficiaries and potential beneficiaries to the unemployed into the portion that can be ascribed to programme changes and the portion that can be explained by labour market conditions. The first row of the table shows that somewhat more than half of the decline in the ratio of beneficiaries to potential beneficiaries was caused by programme changes, with the rest being caused by changes in economic conditions that would have made it harder to qualify for EI and more likely to exhaust benefits even if the programme had not been changed between 1987 and 1997. The second row of Table 4 shows that most of the fall in the ratio of potential beneficiaries to the unemployed was caused by economic conditions, as one would expect, but that a small portion (19 per cent) is attributable to changes in the EI system that reduce the incentives to take short jobs in order to

qualify for EI benefits, in turn increasing the number of long term unemployed and thus reducing the number of potential beneficiaries.

Table 4: Decomposition by programme and labour market conditions

	Programme	Labour Market Conditions
Beneficiaries/Potential Beneficiaries	56% (=18/32) <i>(tightened entrance requirements, cuts in benefit durations)</i>	44% (= 14/32) <i>(greater slack in 1997: harder to qualify and more likely to exhaust benefits)</i>
Potential Beneficiaries/Unemployed	19% (=3/16) <i>(less incentive to work enough to qualify: greater exhaustion)</i>	81% (=13/16) <i>(greater slack due to slower recovery: increased duration)</i>
Total BU Ratio	40%	60%

Note: 'Beneficiaries' is Beneficiaries without earnings.

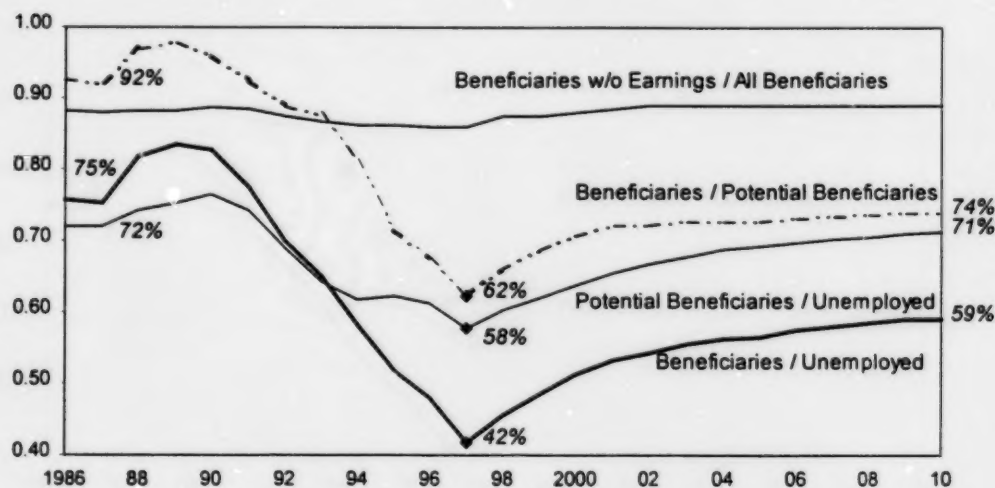
Given that 1987 and 1997 were years with fairly similar unemployment rates, it might seem strange that cyclical influences should have produced such a difference in the BU ratio, adjusted for changes in programme parameters between the two years. The reason for this apparent discrepancy is that 1987 and 1997 were different in one key respect: the natural rate of unemployment was lower in 1997, implying a greater degree of labour market slack for a given actual unemployment rate — as we noted above in our discussion of Figure 4, the economy was further down a lower Beveridge curve than in 1987. This is important because the parameters of the EI system depend on the measured actual unemployment rate, not the actual degree of labour market slack. Holding the EI system constant, workers in 1987 would have found it easier to get enough work to qualify for EI than in 1997, because the natural rate was higher and the degree of labour market slack was correspondingly less for a given unemployment rate. This is evident from Figure 4: the job offer rate in 1987 was 185, almost twice the level in 1997. Indeed, if one examines the job offer rate, there was almost no recovery in the economy between 1992 and 1997: the falls in unemployment that took place were largely due to reductions in EI disincentives.

3. Projecting the Aggregate BU Ratio to 2010

In order to project the likely future behaviour of the EI system over the next ten years we solved the estimation model to provide dynamic projections of the endogenous variables, conditional on a hypothesized path for the unemployment rate.⁵ Note that a dynamic solution implies that predicted values of the endogenous variables were used as lagged dependent variables, rather than the actual values of these variables. A starting level of an 8.5 per cent unemployment rate is assumed for 1998, after which the unemployment rate is hypothesized to decline steadily to a 5.7 per cent natural rate. This natural rate estimate is consistent with the Beveridge curve, depicted in Figure 4, that underlies our econometric model (equation (3) in Appendix II). Social Assistance generosity and the ratio of non-regular EI benefits to total earnings were assumed fixed at their 1997 levels. We took care to allow for the endogenous feedback from the unemployment rate to the Index of EI Disincentives: changes in unemployment affect programme parameters such as entrance requirements and maximum benefit duration, which in turn affect EI disincentives and ultimately the natural rate of unemployment and the actual unemployment rate.

The results for the BU ratio and its various components are depicted in full in Figures A1–A4 in Appendix IV. Our projected value for the BU ratio until 2010 is shown in Figure 16. Given our hypothesized path for the unemployment rate, we project that the BU ratio for all recipients will

Figure 16: Actual and Projected BU Ratio and Components 1986–2010



⁵ There is a complication here that needs to be noted. Although unemployment is considered an endogenous variable over the sample period, determined by the job offer rate and the level of EI disincentives, over the projection period it is assumed exogenous, because we want to make projections conditional on the unemployment rate rather than the job offer rate. The job offer rate is therefore allowed to vary over the projection period according to the Beveridge curve equation (equation (3) in Appendix II). For forecasting purposes only, then, the job offer rate is treated as an endogenous variable.

rise over the next decade to attain a steady state of 59 per cent. Much of this increase will be driven by an increase in the proportion of the unemployed who are potential beneficiaries as the recovery gathers speed and steadily reduces the number of long-term unemployed. By 2010 the ratio of potential beneficiaries to the unemployed is projected to be 71 per cent, similar to its 1987 level. There will also be a recovery in the proportion of potential beneficiaries who receive benefits, to 74 per cent by 2010; however, this is well below the 1987 level of 94 per cent. Note that we are assuming that the EI system will be unchanged after 1997 — apart from measures being phased in as part of the 1996 reforms — and so the decline in unemployment will tend to tighten those programme parameters such as variable entrance requirements and regional extended benefits that depend on local unemployment rates. This largely offsets the increase in beneficiaries resulting from a reduction in labour market slack.

It is instructive to compare our projected steady-state BU ratio in 2010 with the EI system in 1987, holding disincentives constant at their 1987 level. This exercise is performed in Table 4 below. (Note that we do not allow for the fact that the lower unemployment rate in 2010 would normally reduce EI disincentives, given the same EI system, because of the way in which benefit parameters are linked to regional unemployment rates.)

Table 4: Decomposition of the Change in the BU Ratio between 1987 and 2010

Macroeconomic Variables	1987	2010		2010	
EI System	1987	2010		1987	
			% change		% change
Beneficiaries / Potential Beneficiaries	0.93	0.74	-21%	0.85	-9%
X Potential Beneficiaries / Unemployed	0.71	0.71	1%	0.73	4%
/ Prop. of Beneficiaries w/o Earnings	0.89	0.89	0%	0.89	1%
equals:					
BU Ratio (All)	0.74	0.59	-20%	0.70	-6%

According to Table 4, if the 1987 system had been left in place, the BU ratio would have risen to 0.70 by 2010, somewhat below its 1987 value. The proportion of potential beneficiaries would be somewhat higher than in 1987, owing to lower unemployment and thus fewer long-term unemployed. On the other hand, the proportion of potential beneficiaries receiving benefits would be lower, 0.85 rather than 0.93.

4. Projections by Region

In Table 5 and Figures 17 to 20 below we illustrate projections for the BU ratio by region. These estimates are derived from a regional version of the macroeconometric model described in Appendix II. The system was estimated separately for each region; however the labour market

block proved unstable when estimated separately, and so the equation was estimated as a panel data model with fixed regional effects and constant slope coefficients across regions. The parameter estimates are presented in Appendix V. The estimates were similar to those of the aggregate model; however the parameter on the interaction between the job offer rate and EI disincentives was highly insignificant in most cases, and so the systems were re-estimated without this variable.

Table 5 shows that although the BU ratio fell further in Ontario and the West (in percentage terms), it is in the Atlantic region that the greatest increase in the BU ratio is projected. By 2010, the BU ratio in the Atlantic region is projected to be 1.17, about the same as in 1987. In contrast, the BU ratio in Ontario is projected to be 0.40; above the current 0.29 but below the 1987 figure of 0.50. This difference arises because the Atlantic region has not only high structural unemployment, but also high cyclical unemployment: in percentage point terms unemployment is projected to fall further in the Atlantic region (from 14 per cent in 1997 to 7.5 in 2010) than in Ontario (from 8.5 per cent to 4.5 per cent). This means that both the ratio of beneficiaries to potential beneficiaries, and the ratio of potential beneficiaries to the unemployed will rise further in the Atlantic region than in Ontario and the West, given our assumptions about unemployment.

Table 5: Projections for BU Ratio and Components by Region

	1987	1997	% change since 1987	2010	% change since 1987
Atlantic					
Beneficiaries / Potential Beneficiaries	1.36	0.91	-33%	1.18	-14%
Potential Beneficiaries / Unemployed	0.78	0.67	-14%	0.90	16%
All Beneficiaries / Unemployed	1.18	0.70	-40%	1.17	0%
Quebec					
Beneficiaries / Potential Beneficiaries	1.06	0.77	-28%	0.81	-23%
Potential Beneficiaries / Unemployed	0.68	0.55	-19%	0.70	2%
All Beneficiaries / Unemployed	0.83	0.50	-40%	0.64	-23%
Ontario					
Beneficiaries / Potential Beneficiaries	0.70	0.49	-31%	0.49	-30%
Potential Beneficiaries / Unemployed	0.74	0.54	-27%	0.73	-1%
All Beneficiaries / Unemployed	0.59	0.29	-51%	0.40	-32%
West					
Beneficiaries / Potential Beneficiaries	0.81	0.51	-36%	0.59	-27%
Potential Beneficiaries / Unemployed	0.72	0.62	-14%	0.75	5%
All Beneficiaries / Unemployed	0.66	0.36	-45%	0.41	-38%

Figure 17: Atlantic

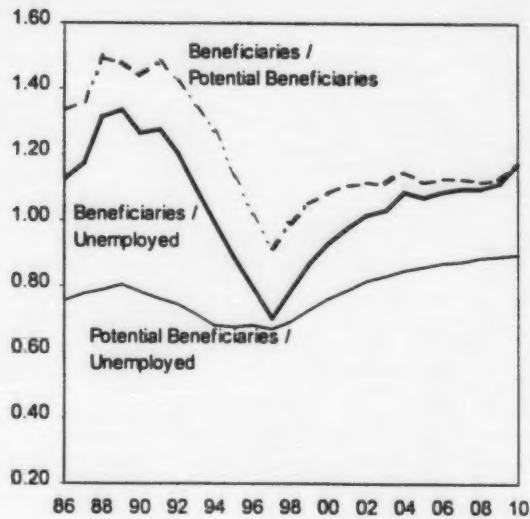


Figure 18: Quebec

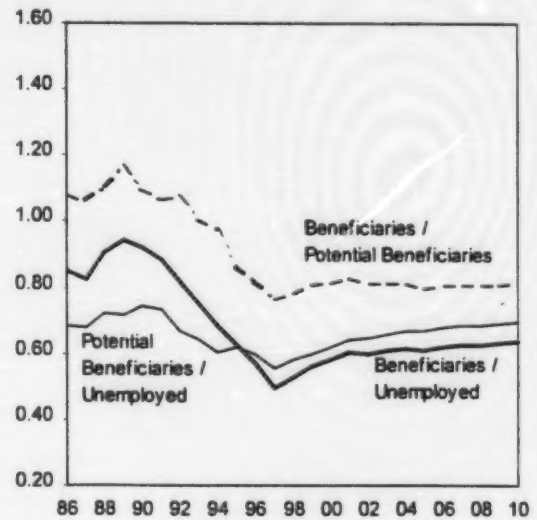


Figure 20: Ontario

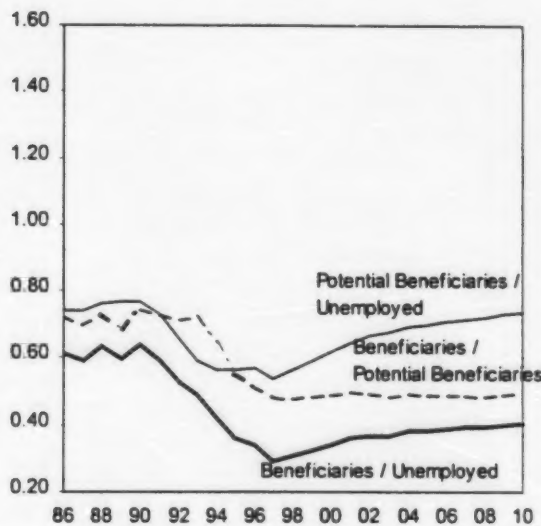
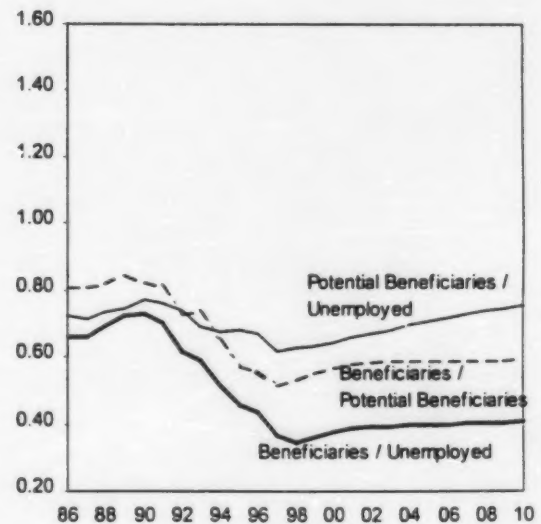


Figure 21: West



5. Projections by Age Group

The econometric model was also estimated separately for two age groups: youths (those aged 15–24), and adults (those aged 25 or over). Because there is no job offer rate available for young people — indeed, it is not clear that this is conceptually possible with most vacancies — we do not estimate a separate Beveridge curve for each age group and instead used our estimates from the aggregate model. The estimation results are shown in Appendix VI below.

One complication in the age group model is that while we have age-specific data for beneficiaries without earnings, we do not have age-specific data for all beneficiaries. We therefore assume that the ratio of beneficiaries without earnings to total beneficiaries is the same across age groups.

The projections in Figures 22 and 23 and in Table 5 show that the future path for the BU ratio for youths is expected to be very different from that for adults. Whereas the BU ratio for adults is projected to rise from 0.52 in 1997 to just below its 1987 level of 0.85 in 2010, the BU ratio for youths is only expected to be about half its 1987 level in 2010. The reason for this discrepancy is that the ratio of beneficiaries to potential beneficiaries for youths is less cyclically responsive than that of adults, despite the 54 per cent fall in this ratio between 1987 and 1997. Because most of the fall in the youth BU ratio is attributable to a decline in the ratio of beneficiaries to potential beneficiaries, and to a fall in the ratio of potential beneficiaries to the unemployed, it seems that the rise in the student enrolment is not a direct cause of the decline in the youth BU ratio. The decline in the BU ratio for adults, on the other hand seems to be more cyclical. As a result the BU ratio for adults is projected to rise significantly as labour market conditions become more favourable whereas for youths the tighter labour markets will only partly offset the impact of successive EI reforms.

Table 5: Projections for the BU Ratio and Components by Age Group

	1987	1997	% change since 1987	2010	% change since 1987
Youths					
Beneficiaries / Potential Beneficiaries	0.73	0.34	-54%	0.43	-42%
Potential Beneficiaries / Unemployed	0.67	0.45	-33%	0.58	-14%
All Beneficiaries / Unemployed	0.56	0.18	-68%	0.28	-51%
Adults					
Beneficiaries / Potential Beneficiaries	1.01	0.72	-29%	0.96	-5%
Potential Beneficiaries / Unemployed	0.74	0.63	-16%	0.75	1%
All Beneficiaries / Unemployed	0.85	0.52	-38%	0.81	-5%

Figure 22: Youths (15-24)

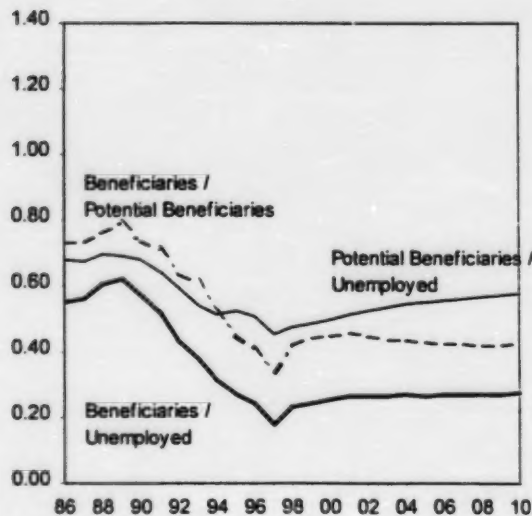
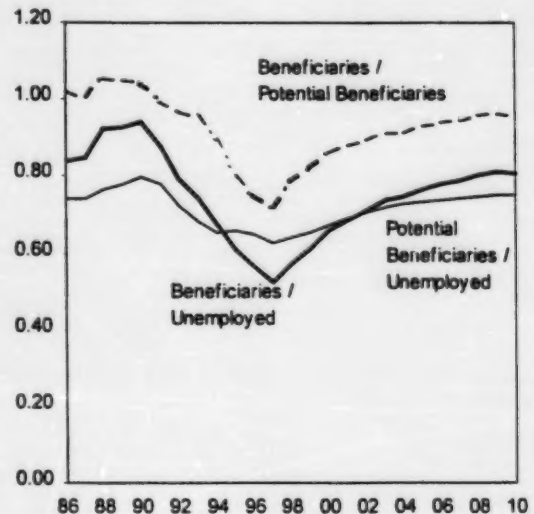


Figure 23: Adults (25+)

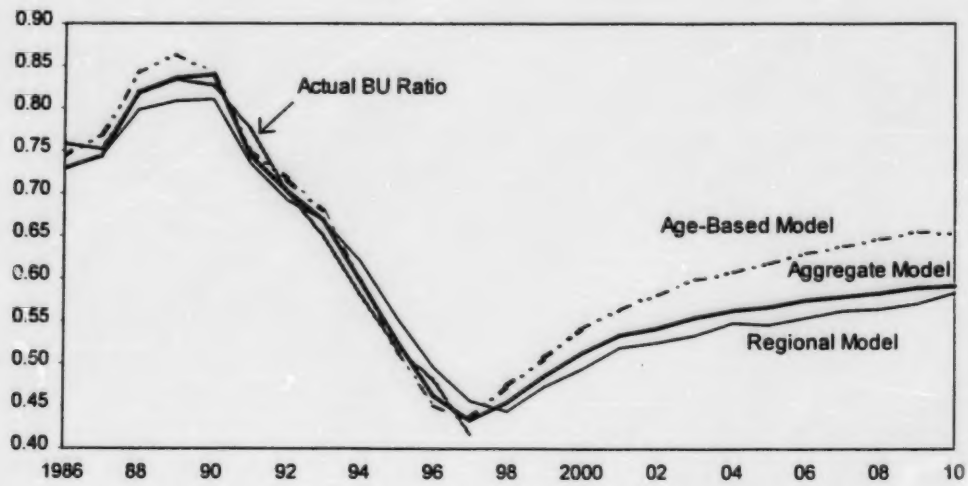


6. Comparison of Aggregate, Regional and Age Group Models

Although the regional and age-specific models are similar in structure to the aggregate model, they use different data, and so the question of consistency between these models and the aggregate model arises. In order to compare the predictions from the three models we need to construct aggregate BU ratio projections from the two disaggregated models; however this is not straightforward, because we would require projections of the weights for each disaggregated group — the proportion of the unemployed in each region or age group. This would require projections of the absolute size of the labour force in each group, which the econometric models are not designed to provide because they depend on factors such as incentives to migrate which are not explicitly modelled in our framework. In order to provide an approximate projection of the aggregate BU ratio from each disaggregated model we used 1997 proportions of each group as weights for the projections.

Figure 24 below shows the projected BU ratio for all beneficiaries from the three different models. The age-specific model predicts a greater recovery in the BU ratio than the aggregate model — to 0.65 by 2010 compared 0.59 — whereas the regional model predicts a smaller recovery — to 0.58 by 2010. It should be noted that it is the aggregate model that has the closest fit to the actual aggregate BU ratio.

Figure 24: Comparison of BU Ratio Projections from the Aggregate and Disaggregated Models



V. Conclusions

We find that three-fifths of the fall in the BU ratio since 1987 was caused by the severity and length of the post-1990 downturn and drawn-out recovery. This period of sluggish recovery has led to an unprecedented increase in the number of long-term unemployed, a group which has never been eligible for EI. The recession was also more severe than the actual unemployment rate would suggest because the natural or structural rate was falling at this time as a result of successive EI reforms, and so actual labour market slack was greater than would have appeared from an examination of the actual unemployment rate alone. Because the parameters of the EI system are tied to the official unemployment rate, and not to the amount of actual labour market slack in the economy, the EI system did not adjust to the severity of the recession as much as it might have done, and the BU ratio fell. In contrast, after the 1981–1982, recession, there was no change in the underlying natural rate and so changes in unemployment were a better indicator of labour market slack.

Two-fifths of the fall in the BU ratio is attributable to successive EI reforms which have tightened entrance requirements and cut benefit durations. As a result, the BU ratio will not return to its 1989 peak; instead we project that the BU ratio will rise gradually to about 59 per cent in the long run from its 1997 level of 42 per cent.

Two disaggregated versions of the econometric model were estimated: a regional model, and an age group model. The regional model predicts that the recovery in the BU ratio will be much greater in the Atlantic region than elsewhere, widening the disparity in regional BU ratios. This disparity exists because the EI programme is less restrictive in high unemployment regions such as the Atlantic region, which makes qualifying for EI much easier than in other regions. The age-specific model predicts that the recovery in the BU ratio for adults will be much greater than for youths. This is because the BU ratio for youths seems to be less cyclically sensitive than that for adults: consequently the projected fall in the unemployment rate will have less impact on the BU ratio for youths.

A possible objection to our projection of a rising BU ratio over the next decade is that previous forecasts of a rising BU ratio have been proved wrong. Bédard (1995) predicted a rise in the BU ratio beginning in 1995: the actual outcome was a continuance of the decline. Bédard's forecast error arose because the recovery from the 1990–1991 recession stalled in 1995: after a year of robust growth in 1994 there was slower growth for the next two years. It is only since the beginning of 1997 that the unemployment rate has started to decline significantly. Bédard was assuming a fall in the unemployment rate in his projections, and so the failure of this fall in unemployment to materialize meant that his forecast was in error. Our projections are also based on a hypothesized steady fall in unemployment: if unemployment were to remain around 8 per cent, the BU ratio would remain significantly lower than 59 per cent for the foreseeable future.

Appendix I: Data

National Accounts

GDP GDP at Market Prices (CANSIM Matrix 6547).

EI Administrative Data

ExpReg Total Regular EI Benefit Expenditures (Matrix 5702).

AWB Average Weekly Benefits (Matrix 5704).

BenAll Regular EI Beneficiaries (Matrix 5705).

Ben Regular EI Beneficiaries without reported earnings (Matrix 5706).

MIE Maximum Insurable Earnings. (From CEFM).

Labour Market Data

JOR Job Offer Rate. The ratio of the Help Wanted Index (CANSIM Matrix 105) to total employment. (From LFS CD-ROM 71F0004XCB), indexed so that 1991=100.

UR Unemployment rate for the civilian labour force aged 15+. (From LFS CD-ROM 71F0004XCB)

PB Potential Beneficiaries. Equal to total unemployment less those who have never worked, those who have been out of work for more than 12 months, and those who left their job to attend school if not out of work for more than 12 months. (From LFS CD-ROM 71F0004XCB).

Wages

w Average Weekly Earnings (including overtime) (CANSIM Matrices 4288 and 1433). Pre-1983 data are spliced to the new data.

Structural Variables

EID Index of Employment Insurance Disincentives. Taken from Sargent (1995; 1998). The index is normalized to equal 100 in 1970. A level of zero corresponds to no EI disincentives at all.

SOCASS Social Assistance Benefit Rate. For 1987 and 1990–1996 this is

the average provincial welfare rate for a couple with two children (taken from the National Council of Welfare's annual publication *Welfare Incomes*) divided by twice the average annual wage ($52 \times AWE$). For 1976-1986 and 1988-1989 the rate is extrapolated using HRDC administrative data on average General Assistance benefits per recipient. Values for 1997 and the projections were set at the 1996 level.

Appendix II: The Estimation Model

The model is composed of two blocks: an *EI expenditure block* that determines expenditure as a proportion of wages multiplied by unemployment (a measure of the lost earnings of the unemployed), and a *labour market block* that estimates a Beveridge curve relation between vacancies and the stock of unemployment. Each block is estimated separately: the EI expenditure block by iterative three-stage least squares and the labour market block by instrumental variables.

a) The EI Expenditure Block

The EI expenditure block consists of four behavioural equations and four identities. The behavioural equations are estimated as a system by iterative three-stage least squares, which is equivalent to full information maximum likelihood in a linear system such as this one. The expenditure block can be further subdivided into three sub-blocks: one that determines the BU ratio; one that determines the average replacement rate; and a series of identities that combine the two other sub-blocks into an expression for total expenditures as a proportion of total earnings. The equations determining the BU ratio are:

$$Ben/PB = a_1 + a_2 \cdot JOR + a_3 \cdot JOR_{-1} + a_4 \cdot EID + a_5 \cdot UR_{-1} + a_6 \cdot (JOR \cdot EID) + \varepsilon_a \quad (1.1)$$

$$PB/U = b_1 + b_2 \cdot PB_{-1}/U_{-1} + b_3 \cdot JOR_{-1} + b_4 \cdot EID_{-1} + b_5 \cdot SOCASS_{-1} + \varepsilon_b \quad (1.2)$$

$$BU \equiv Ben/PB \cdot PB/U \quad (1.3)$$

$$Ben/BenAll = c_1 + c_2 \cdot JOR + c_3 \cdot JOR_{-1} + c_4 \cdot MIE/w + c_5 \cdot MIE_{-1}/w_{-1} + \varepsilon_c \quad (1.4)$$

$$BUAll \equiv BU / (Ben/BenAll) \quad (1.5)$$

The first equation specifies the ratio of beneficiaries without reported earnings (*Ben*) to potential beneficiaries (*PB*) as a function of the current and lagged job offer rate (*JOR*), the parameters of the EI programme as summarized by the Index of EI Disincentives (*EID*), and the lagged unemployment rate (*UR*). The lagged value of the EI Index, and its current and lagged values at a constant nine per cent unemployment rate were used as instruments for the current value of the EI Index, which is partly a function of current unemployment. The rationale for including the job offer rate and the unemployment rate as an explanatory variable is that the compositional changes in the potential beneficiaries over the cycle could affect eligibility for and take-up of EI benefits. For example, the quit rate is normally quite pro-cyclical:⁶ given that those who quit are

⁶ See Picot and Lin (1997).

not normally eligible for EI, one would expect fewer potential beneficiaries (by our definition) to receive EI. On the other hand, during recessions relatively more of total unemployment consists of strongly attached workers with much work experience, often on temporary layoff: these workers would be entitled to longer spells of benefits than more marginally attached workers. The interaction term between the job offer rate and EI disincentives is included because the impact of programme parameters may differ at different levels of labour market tightness.

Equation (1.2) models the proportion of the unemployed (U) who are likely to be potential beneficiaries of EI. The ratio is specified as a function of the lagged job offer rate, the lagged value of the EI Index and the lagged generosity of Social Assistance (*SOCASS*). Lagged values are used because the bulk of non-potential beneficiaries are those who have been out of work for at least 12 months, implying that it is labour market conditions — the flow of people into the unemployment pool — in the previous year that are most important for explaining the stock of long-term unemployed this year. Social Assistance (SA) generosity is relevant because it will influence the number of long-term unemployed. The more generous are SA benefits, the more likely people would be to continue their unemployment spell after the point at which EI benefits run out, at least in theory. All else equal, this will increase the proportion of long-term unemployed and so reduce the proportion of potential beneficiaries amongst the total unemployed.

The third equation is simply an identity which gives the BU ratio for beneficiaries without earnings as a ratio of the unemployed. Recall from section III that only these beneficiaries would be counted as unemployed by the Labour Force Survey. Equation (1.4) models the proportion of EI regular beneficiaries who report earnings. This is modelled as a function of labour market conditions and the ratio of the maximum insurable earnings limit (*MIE*) to average weekly earnings (w). Labour market conditions will influence the availability of part-time jobs, and the *MIE* limit affects the maximum allowable earnings from part-time work before benefits are reduced. (We experimented with the average replacement rate, but this variable proved to be highly insignificant.) Finally, the fifth equation is an identity which gives the BU ratio for all beneficiaries, not just those without reported earnings.

The second sub-block is a behavioural equation for the average replacement ratio ($AvRR$):

$$AvRR = d_1 + d_2 \cdot AvRR_{-1} + d_3 \cdot StatRR + d_4 \cdot MIE / w + d_5 \cdot UR + d_6 \cdot UR_{-1} + \epsilon_d \quad (1.6)$$

The average replacement ratio ($AvRR$) is average weekly EI benefits divided by average weekly earnings (including overtime). This is modelled as a function of the unemployment rate, the statutory replacement rate (*StatRR*), and the ratio of the *MIE* limit to average weekly earnings. The lagged job offer rate was used as an instrumental variable for the current unemployment rate (UR). The level of unemployment will affect the average replacement rate by changing the composition of the unemployment pool. During a downturn more strongly attached, better paid

workers come into the unemployment pool, thus raising average benefits. The job offer rate was dropped from this equation because it was insignificant at any reasonable significance level.

Finally, there are two identities which relate the average replacement rate and the BU ratio to total EI expenditures:

$$ExpReg / (w \cdot U) \equiv BUAll \cdot AvRR \quad (1.7)$$

$$ExpTot / (w \cdot E) \equiv ExpReg / (w \cdot U) \cdot UR / (1 - UR) + ExpOth / (w \cdot E). \quad (1.8)$$

The first identity we have already met in Section II: total regular EI benefits (*RegExp*) can be decomposed into the product of the BU ratio for all beneficiaries (*Buall*) and the average weekly benefits (*AvRR*). The second identity aggregates spending on regular benefits and spending on special benefits in to the ratio of total EI spending to total earnings, where total earnings is given by the product of employment (*E*) and average weekly earnings including overtime (*w*). *ExpOth* is total expenditures on Special Benefits and Developmental Uses. This last variable is assumed to be exogenous to the model as it does not appear to have a pronounced cyclical pattern.

b) The Labour Market Block

We assume that the unemployment rate is a function of the vacancy rate, proxied by the job offer rate, and the willingness of the unemployed to accept jobs, which is in turn assumed to depend on the level of EI disincentives. This endogeneity of the unemployment rate does not have to be modelled explicitly for the purposes of within-sample analysis of the behaviour of the EI system for a given job offer rate and unemployment rate. However, for out-of-sample projections and for what-if analysis we need to specify an unemployment equation explicitly. If, for example, we want to know what the BU ratio would be if EI disincentives were lower, we need to allow for the fact that lower EI disincentives will lower unemployment, which will in turn have an impact on the BU ratio. The behavioural equation for the unemployment rate is:

$$UR = f_1 + f_2 \cdot UR_{-1} + f_3 \cdot JOR + f_4 \cdot JOR_{-1} + f_5 \cdot EID + f_6 \cdot EID_{-1} + \varepsilon_f \quad (3)$$

Lagged EI disincentives and the EI Index held constant assuming nine per cent unemployment rate are used as instruments for the current value of the EI Index. Nine per cent is about the average unemployment rate throughout the sample period. Equation (3) essentially expresses a Beveridge curve relationship (depicted in Figure 4) between the stock of unemployment and the vacancy rate; this curve is moved in or out by the level of EI disincentives.

Appendix III: Estimation Results from the Aggregate Model**1. EI Expenditure Block**

Iterative 3SLS estimation results:

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
a_1	-0.68253	0.103434	-6.59865	0.0000
a_2	0.003295	0.001089	3.026062	0.0036
a_3	0.002878	0.000297	9.685325	0.0000
a_4	0.00617	0.000896	6.887652	0.0000
a_5	4.679487	0.494595	9.461246	0.0000
a_6	-2.93E-05	7.41E-06	-3.95679	0.0002
b_1	0.221118	0.068515	3.22728	0.0020
b_2	0.547857	0.085076	6.439578	0.0000
b_3	0.000709	9.25E-05	7.664257	0.0000
b_4	0.000303	0.000142	2.131487	0.0370
b_5	-0.15518	0.12081	-1.28453	0.2037
c_1	1.08069	0.011741	92.04369	0.0000
c_2	-0.00014	5.02E-05	-2.86138	0.0057
c_3	0.000161	4.99E-05	3.21523	0.0021
c_4	-0.02759	0.027492	-1.00358	0.3195
c_5	-0.13622	0.027041	-5.03741	0.0000
d_1	-0.14901	0.036238	-4.11204	0.0001
d_2	0.314626	0.061394	5.124665	0.0000
d_3	0.485744	0.050367	9.644158	0.0000
d_4	0.138449	0.01216	11.38534	0.0000
d_5	0.414362	0.104222	3.975783	0.0002
d_6	-0.50697	0.106702	-4.75128	0.0000

<i>Equation</i>	(1.1)	(1.2)	(1.4)	(1.6)
Adj. R-Squared	0.9544	0.9383	0.9426	0.9416
Std Err. of the Reg.	0.02191	0.01399	0.00622	0.005208
Durbin-Watson Statistic	2.221	1.685	1.412	2.781

2. *Labour Market Block*

Instrumental Variable Results:

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
f_1	0.02774	0.01380	2.0099	0.0628
f_2	0.7176	0.1031	6.9565	0.0000
f_3	-0.0002969	4.798E-05	-6.1871	0.0000
f_4	0.0001870	6.465E-05	2.8934	0.0111
f_5	0.0003197	0.0001004	3.1850	0.0061
f_6	-0.0002158	9.865E-05	-2.1875	0.0450
Adj. R-Squared	0.9066			
Std Err. of the Reg.	12.36			
Durbin-Watson Stat.	2.560			

Appendix IV: Dynamic Projections from the Aggregate Model

Figure A1: Ratio of Actual to Potential Beneficiaries

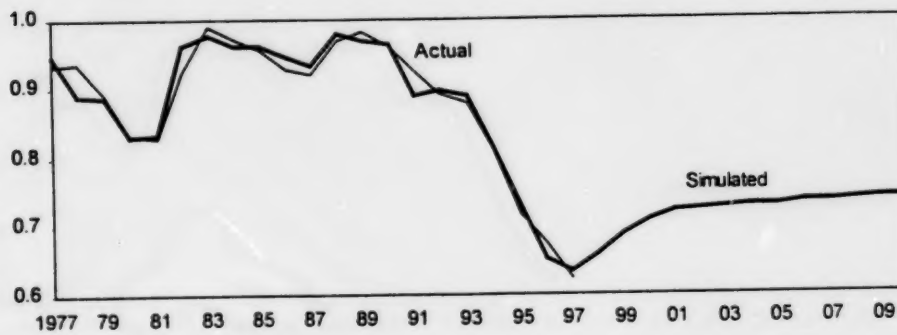


Figure A2: Ratio of Potential Beneficiaries to the Unemployed

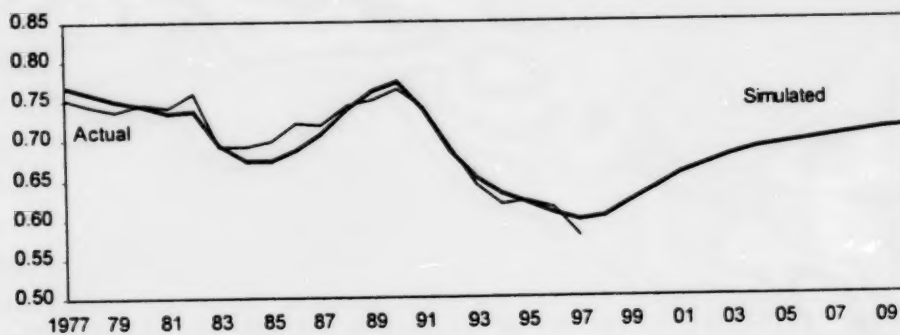


Figure A3: Ratio of Regular Beneficiaries without Earnings to Total Regular Beneficiaries

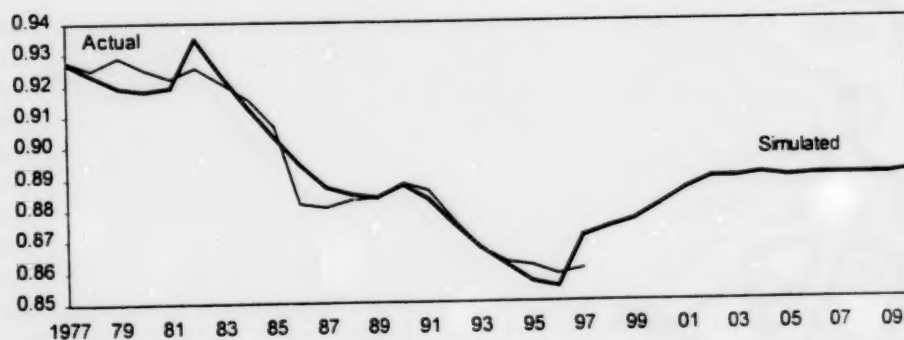
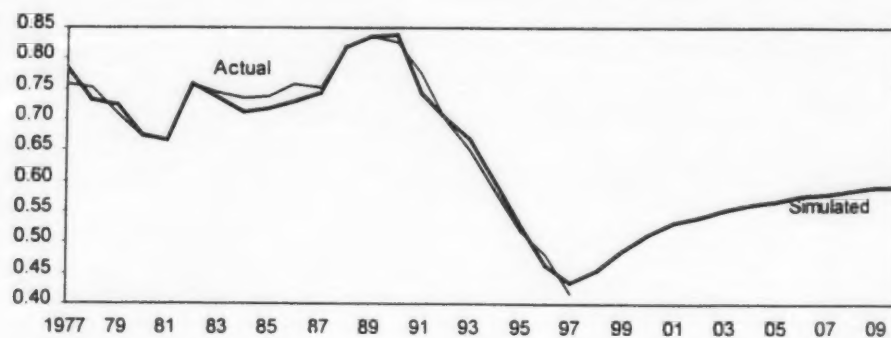


Figure A4: Ratio of Regular Beneficiaries to the Unemployed



Appendix V: Estimation Results from the Regional Model**1. EI Expenditure Block**

Iterative 3SLS estimation results:

Atlantic Region

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
a_1	-0.0608	0.2137	-0.2843	0.7771
a_2	-0.0041	0.0010	-4.2323	0.0001
a_3	0.0061	0.0010	6.1048	0.0000
a_4	0.0050	0.0006	7.8099	0.0000
a_5	0.0272	0.0104	2.6228	0.0109
b_1	0.4268	0.0872	4.8941	0.0000
b_2	0.4151	0.1261	3.2916	0.0016
b_3	0.0008	0.0001	5.3311	0.0000
b_4	0.0003	0.0002	2.0916	0.0405
b_5	-0.5345	0.1647	-3.2459	0.0019
c_1	1.0364	0.0050	208.5076	0.0000
c_2	-3.65E-05	3.97E-05	-0.9206	0.3608
c_3	1.24E-04	3.74E-05	3.3175	0.0015
c_4	-0.0592	0.0127	-4.6719	0.0000
c_5	-0.0560	0.0123	-4.5485	0.0000
d_1	-0.1796	0.0541	-3.3166	0.0015
d_2	0.3135	0.0804	3.8974	0.0002
d_3	0.5326	0.0714	7.4620	0.0000
d_4	0.1652	0.0180	9.1688	0.0000
d_5	0.0018	0.0025	0.7166	0.4763
d_6	-0.0052	0.0022	-2.3314	0.0229

<i>Equation</i>	(1.1)	(1.2)	(1.4)	(1.6)
Adj. R-Squared	0.737	0.901	0.976	0.912
Std Err. of the Reg.	0.07588	0.01230	0.00335	0.00835
Durbin-Watson Statistic	1.481	2.016	1.702	2.713

Quebec

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
a_1	-0.4393	0.1768	-2.4845	0.0156
a_2	-0.0006	0.0004	-1.4417	0.1543
a_3	0.0034	0.0006	5.2586	0.0000
a_4	0.0024	0.0004	5.3534	0.0000
a_5	0.0663	0.0124	5.3503	0.0000
b_1	0.2388	0.0959	2.4901	0.0154
b_2	0.4090	0.1060	3.8598	0.0003
b_3	0.0008	0.0001	5.6700	0.0000
b_4	0.0004	0.0002	1.9206	0.0593
b_5	-0.0240	0.1862	-0.1289	0.8979
c_1	1.0916	0.0135	80.9409	0.0000
c_2	-2.70E-04	6.54E-05	-4.1237	0.0001
c_3	3.08E-04	6.49E-05	4.7476	0.0000
c_4	-0.0427	0.0326	-1.3124	0.1941
c_5	-0.1292	0.0322	-4.0156	0.0002
d_1	-0.1914	0.0423	-4.5200	0.0000
d_2	0.5171	0.0552	9.3692	0.0000
d_3	0.4557	0.0578	7.8917	0.0000
d_4	0.1107	0.0116	9.5185	0.0000
d_5	0.0010	0.0012	0.8359	0.4064
d_6	-0.0014	0.0012	-1.1793	0.2427

<i>Equation</i>	(1.1)	(1.2)	(1.4)	(1.6)
Adj. R-Squared	0.785	0.867	0.938	0.932
Std Err. of the Reg.	0.05208	0.02048	0.00764	0.00640
Durbin-Watson Statistic	1.116	2.083	1.412	2.802

Ontario

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
a_1	-0.3532	0.0809	-4.3669	0.0000
a_2	-0.0005	0.0002	-2.1327	0.0369
a_3	0.0022	0.0003	7.4621	0.0000
a_4	0.0037	0.0003	12.2752	0.0000
a_5	0.0415	0.0055	7.5517	0.0000
b_1	0.2125	0.0664	3.2004	0.0022
b_2	0.4811	0.0774	6.2185	0.0000
b_3	0.0008	0.0001	7.2561	0.0000
b_4	0.0009	0.0002	4.6121	0.0000
b_5	-0.2848	0.1337	-2.1305	0.0370
c_1	1.0859	0.0153	71.1093	0.0000
c_2	-1.39E-04	4.77E-05	-2.9071	0.0050
c_3	8.22E-05	4.81E-05	1.7089	0.0924
c_4	-0.0328	0.0349	-0.9380	0.3518
c_5	-0.1293	0.0342	-3.7787	0.0004
d_1	-0.1005	0.0543	-1.8514	0.0688
d_2	0.3783	0.0720	5.2519	0.0000
d_3	0.3915	0.0704	5.5579	0.0000
d_4	0.1267	0.0180	7.0573	0.0000
d_5	0.0062	0.0013	4.8554	0.0000
d_6	-0.0075	0.0012	-6.0442	0.0000

<i>Equation</i>	(1.1)	(1.2)	(1.4)	(1.6)
Adj. R-Squared	0.785	0.867	0.938	0.932
Std Err. of the Reg.	0.05208	0.02048	0.00764	0.00640
Durbin-Watson Statistic	1.116	2.083	1.412	2.802

Prairies

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
a_1	-0.1038	0.1110	-0.9355	0.3531
a_2	-0.0007	0.0003	-2.0371	0.0458
a_3	0.0017	0.0005	3.5816	0.0007
a_4	0.0018	0.0005	3.5420	0.0008
a_5	0.0553	0.0099	5.5690	0.0000
b_1	0.5564	0.0881	6.3171	0.0000
b_2	0.1760	0.1011	1.7401	0.0867
b_3	0.0006	0.0001	7.5385	0.0000
b_4	0.0001	0.0001	1.1600	0.2504
b_5	-0.1768	0.1047	-1.6889	0.0962
c_1	1.0818	0.0125	86.2796	0.0000
c_2	-8.55E-06	3.72E-05	-0.2297	0.8191
c_3	5.50E-05	3.91E-05	1.4062	0.1646
c_4	-0.0921	0.0218	-4.2292	0.0001
c_5	-0.0676	0.0201	-3.3571	0.0013
d_1	-0.2017	0.0355	-5.6752	0.0000
d_2	0.2308	0.0842	2.7418	0.0079
d_3	0.6652	0.0597	11.1483	0.0000
d_4	0.1354	0.0139	9.7077	0.0000
d_5	0.0030	0.0016	1.8873	0.0637
d_6	-0.0042	0.0015	-2.7954	0.0069

<i>Equation</i>	(1.1)	(1.2)	(1.4)	(1.6)
Adj. R-Squared	0.772	0.854	0.967	0.928
Std Err. of the Reg.	0.06024	0.01564	0.00589	0.00635
Durbin-Watson Statistic	0.966	1.286	1.828	1.868

British Columbia

<i>Parameter</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
a_1	0.2797	0.0541	5.1673	0.0000
a_2	0.0000	0.0004	-0.0701	0.9443
a_3	0.0014	0.0004	3.5771	0.0007
a_4	0.0027	0.0003	8.4650	0.0000
a_5	-0.0017	0.0047	-0.3743	0.7094
b_1	-0.0998	0.1155	-0.8638	0.3909
b_2	0.8403	0.1095	7.6764	0.0000
b_3	0.0006	0.0002	3.3564	0.0013
b_4	0.0006	0.0002	2.9398	0.0046
b_5	0.2347	0.2180	1.0768	0.2857
c_1	1.0268	0.0077	133.5994	0.0000
c_2	-1.48E-04	4.76E-05	-3.1115	0.0028
c_3	1.07E-04	4.92E-05	2.1789	0.0331
c_4	-0.0760	0.0246	-3.0869	0.0030
c_5	-0.0484	0.0237	-2.0431	0.0452
d_1	-0.0444	0.0441	-1.0059	0.3183
d_2	0.1710	0.1046	1.6343	0.1072
d_3	0.4211	0.0677	6.2193	0.0000
d_4	0.1524	0.0200	7.6252	0.0000
d_5	0.0018	0.0012	1.4760	0.1449
d_6	-0.0039	0.0013	-3.0988	0.0029

<i>Equation</i>	(1.1)	(1.2)	(1.4)	(1.6)
Adj. R-Squared	0.814	0.790	0.937	0.917
Std Err. of the Reg.	0.04582	0.02519	0.00575	0.00789
Durbin-Watson Statistic	1.856	1.925	1.326	2.265

2. Labour Market Block

Instrumental Variable Results:

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
f_1^{Atlantic}	4.3497			
f_1^{Quebec}	3.8099			
f_1^{Ontario}	3.2069			
f_1^{Prairies}	2.8610			
f_1^{BC}	3.1880			
f_2	0.7006	0.0520	13.4603	0.0000
f_3	-0.0255	0.0031	-8.2445	0.0000
f_4	0.0158	0.0036	4.3811	0.0000
f_5	0.0357	0.0062	5.7801	0.0000
f_6	-0.0294	0.0062	-4.7570	0.0000
Adj. R-Squared	0.9444			
Std Err. of the Reg.	0.6779			
Durbin-Watson Stat.	2.2169			

Appendix VI: Estimation Results from the Regional Model

Iterative 3SLS estimation results:

Youths (Aged 15-24)

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
a_1	-0.9785	0.1127	-8.6815	0.0000
a_2	0.0002	0.0015	0.1377	0.8909
a_3	0.0043	0.0006	7.6014	0.0000
a_4	0.0045	0.0013	3.5130	0.0008
a_5	0.0387	0.0065	5.9442	0.0000
a_6	-7.57E-06	9.58E-06	-0.7904	0.4322
b_1	0.1134	0.1002	1.1313	0.2622
b_2	0.6899	0.1239	5.5704	0.0000
b_3	0.0006	0.0002	3.5638	0.0007
b_4	0.0005	0.0002	2.1350	0.0366
b_5	-0.2610	0.2024	-1.2899	0.2017
c_1	1.0857	0.0111	97.9239	0.0000
c_2	-1.19E-04	4.78E-05	-2.4892	0.0154
c_3	1.27E-04	4.77E-05	2.6566	0.0100
c_4	-0.0642	0.0260	-2.4706	0.0162
c_5	-0.1014	0.0260	-3.8975	0.0002
d_1	-0.1572	0.0359	-4.3813	0.0000
d_2	0.3327	0.0572	5.8190	0.0000
d_3	0.4917	0.0490	10.0316	0.0000
d_4	0.1332	0.0110	12.0805	0.0000
d_5	0.0025	0.0006	4.1037	0.0001
d_6	-0.0029	0.0006	-4.7568	0.0000

<i>Equation</i>	(1.1)	(1.2)	(1.4)	(1.6)
Adj. R-Squared	0.963	0.919	0.949	0.943
Std Err. of the Reg.	0.02690	0.02200	0.00589	0.00514
Durbin-Watson Statistic	2.528	1.322	1.367	2.884

Adults (Aged 25+)

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
a_1	-0.7194	0.1192	-6.0372	0.0000
a_2	0.0077	0.0009	8.3621	0.0000
a_3	0.0011	0.0003	3.9440	0.0002
a_4	0.0102	0.0008	12.1660	0.0000
a_5	0.0224	0.0054	4.1580	0.0001
a_6	-5.47E-05	6.45E-06	-8.4854	0.0000
b_1	0.2292	0.0584	3.9240	0.0002
b_2	0.5465	0.0645	8.4681	0.0000
b_3	0.0007	0.0001	9.7934	0.0000
b_4	0.0003	0.0001	2.2968	0.0249
b_5	-0.1233	0.1055	-1.1685	0.2469
c_1	1.0838	0.0112	96.9648	0.0000
c_2	-1.30E-04	4.80E-05	-2.7026	0.0088
c_3	1.36E-04	4.80E-05	2.8316	0.0062
c_4	-0.0568	0.0247	-2.2990	0.0248
c_5	-0.1072	0.0245	-4.3764	0.0000
d_1	-0.1817	0.0372	-4.8852	0.0000
d_2	0.3925	0.0637	6.1647	0.0000
d_3	0.4833	0.0539	8.9619	0.0000
d_4	0.1416	0.0147	9.6321	0.0000
d_5	0.0047	0.0016	3.0015	0.0038

d_6	-0.0066	0.0017	-3.8668	0.0003
<i>Equation</i>	(1.1)	(1.2)	(1.4)	(1.6)
Adj. R-Squared	0.936	0.951	0.948	0.935
Std Err. of the Reg.	0.02765	0.01256	0.00593	0.00549
Durbin-Watson Statistic	1.833	2.122	1.353	3.036

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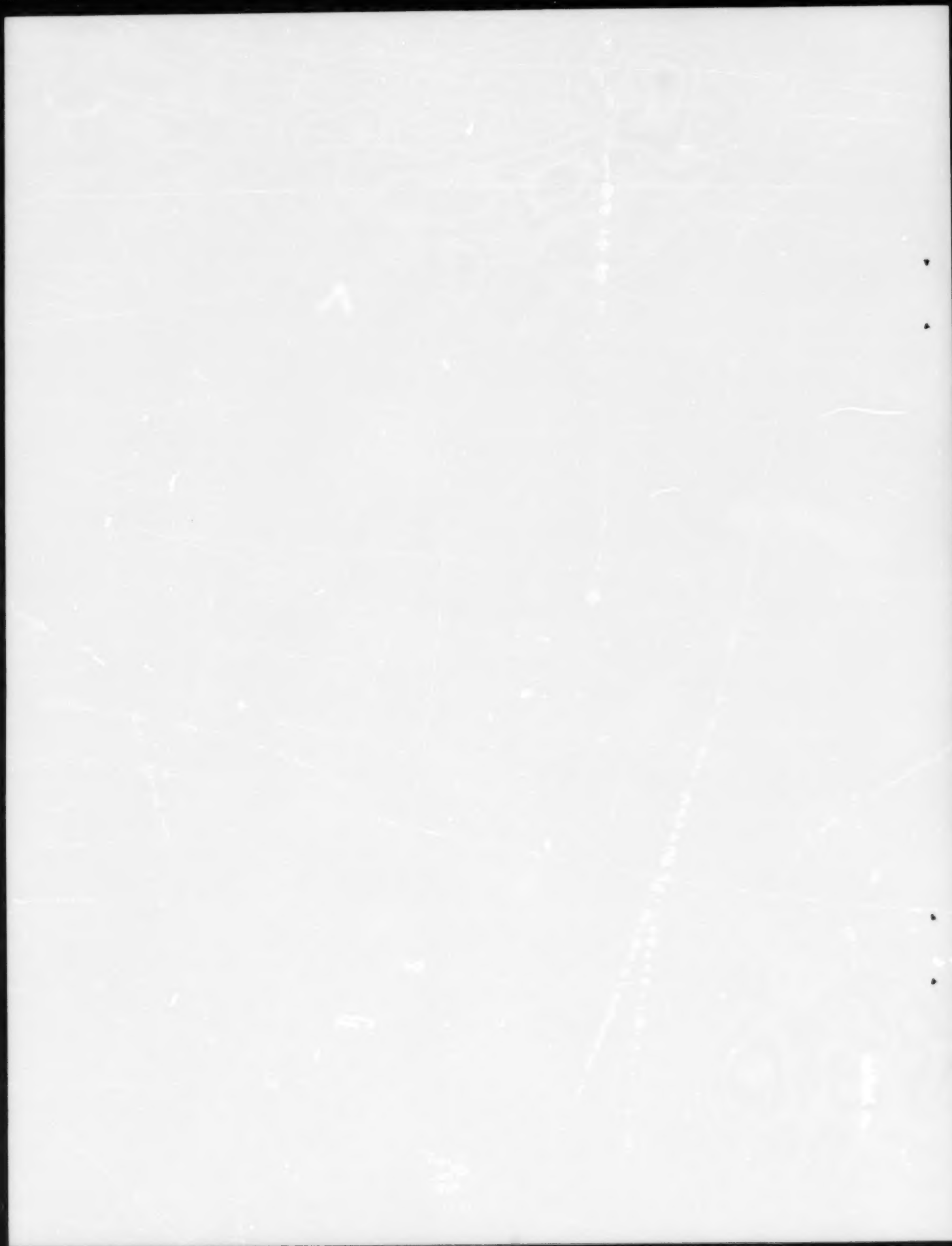
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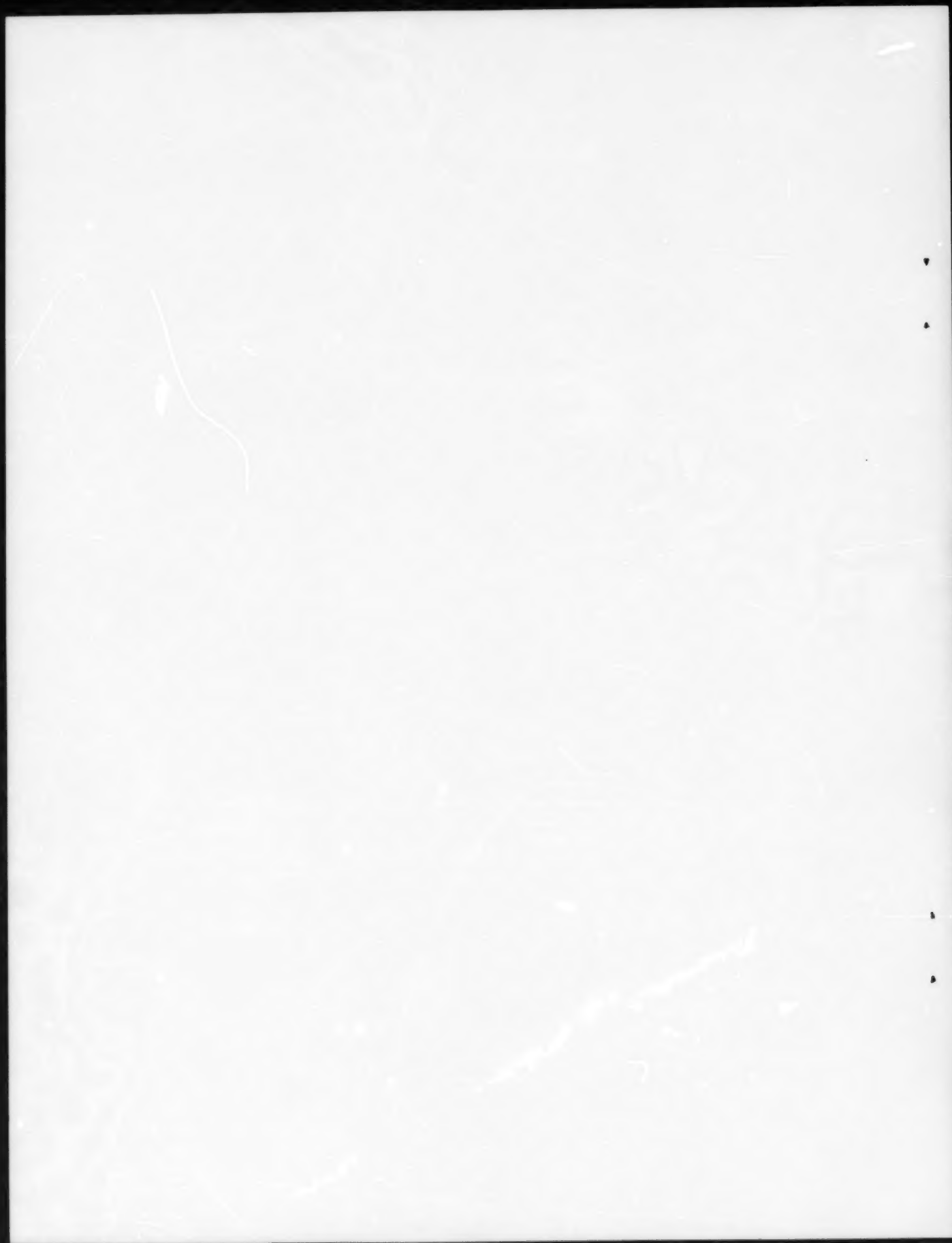
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